



Clinical Study

Sex differences in health-related quality of life among adult stroke patients in Northeastern China

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ABSTRACT

Inconsistent results have been reported for the impact of sex on stroke outcomes. We investigated the differences in health-related quality of life between adult male and female stroke survivors in Northeastern China. Information on background variables was collected during hospital stay. Follow-up data were obtained through a phone interview 6 months after discharge, which included the Barthel Index and a 36-Item Short-Form Health Survey (SF-36) reflecting overall health status. The independent effects of sex on activities of daily living independence (Barthel Index ≥ 95) were analyzed. Our results showed that female stroke patients were older than male stroke patients and were more likely to have transient ischemic attack and hypertension. Male stroke patients were more likely to have a history of smoking, heart disease and dyslipidemia, while female patients were less likely to achieve daily living independence. The mean scores of physical functioning, bodily pain, vitality, social functioning, emotional role, and mental health in the SF-36 survey were significantly higher in men than woman. Regression analyses confirmed that female sex was adversely associated with overall health status at discharge. In conclusion, our data demonstrated that there were sex differences in stroke recovery and quality of life among Chinese stroke survivors at 6 months post-discharge, with an overall worse stroke outcome for female stroke survivors.

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1. Introduction

Stroke is the leading cause of long-term adult disability and a leading cause of death in Western countries [1–4]. Many sex differences are seen in the epidemiology, incidence, risk factors, outcomes and mortality rates of stroke [5–7]. In general, men have a higher risk of stroke than women, but the lifetime risk of stroke is higher in women. The functional outcomes of stroke are often worse in women. The incidence of stroke is also different between men and women, but this difference varies among age subgroups. Overall, the stroke death rate is lower in women than in men, and men have a younger average age at stroke death than women. However, the impact of sex on overall health status of stroke survivors has not been accurately determined because there are many other factors, including age and pre-existing medical conditions that affect stroke outcomes. Several studies have reported that female stroke survivors were more likely to have severe physical impairments, profound limitations in the activities of daily living (ADL) or basic components of self-care, and low overall quality of life (QoL) [8–10]. Most likely due to these reasons, female stroke

patients are less likely to be discharged home than male survivors [7]. However, there are inconsistent reports regarding the impact of sex on stroke outcomes [11]. Clearly, better-designed studies are needed to evaluate sex differences in stroke outcomes and to understand the underlying mechanisms.

In the present study, we assessed the impact of sex on health-related quality of life (HRQoL) in Chinese stroke survivors at 6 months post-discharge. Our data demonstrated a significant impact of sex on stroke recovery and QoL, with an overall worse stroke outcome for female stroke survivors.

2. Materials and methods

2.1. Participants

This study was approved by our institute's Human Research Ethical Committee, and informed consent was obtained from all participants. A total of 402 acute stroke survivors were prospectively enrolled at the First Affiliated Hospital of Liaoning Medical University and Fuxin No. 2 People's Hospital, Liaoning province, China, from January 2011 to January 2012. Information on background variables were collected during their stay in hospital, including demographics, National Institutes of Health Stroke Scale

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(NIHSS) score, medical history, pre-stroke and post-stroke ambulatory status, and modified Rankin Scale (mRS) at discharge [12]. Other parameters, including the Barthel Index (BI) and a Short-Form Health Survey, were collected from the patient or his/her proxy during a telephone interview 6 months post-discharge.

Medical history for stroke, diabetes, heart disease, and hypertension was categorized as present *versus* absent/no information. Ambulatory status was dichotomized as independent *versus* dependent (defined as needing assistance or unable to ambulate). Race/ethnicity was categorized as Han *versus* other. Age was categorized by 10 year intervals as <50, 50–59, 60–69, 70–79, and ≥ 80 years old. The mRS was analyzed both as a six point ordinal measure and as a dichotomous outcome (0–2 and 3–5). Stroke severity was assessed using the NIHSS score derived from a standardized neurological examination, and was categorized as mild (NIHSS score <6), moderate (NIHSS score 6–13), and severe (NIHSS score ≥ 14).

2.2. Inclusion and exclusion criteria

Stroke patients older than 18 years were included according to the World Health Organization definition and stroke was confirmed using CT scan or MRI. All hospitalized acute stroke patients were eligible for this study, except for those who had other severe co-morbidities, dementia or a history of dementia, or required assistance for in their daily life before stroke.

2.3. Clinical assessment

We defined ADL independence as a score of ≥ 95 on the BI. The BI evaluates 10 basic activities of self-care (feeding, grooming, dressing, toileting, bathing, and bowel and bladder continence) and mobility (transferring, walking, and stair climbing) with a total score ranging from 0 (totally dependent) to 100 (totally independent) [13]. The mRS is a global outcome rating scale from 0 (no impairment) to 5 (bedridden, incontinent, requiring constant nursing care and attention) and 6 (dead) [14].

In addition, we used the 36-Item Short-Form Health Survey (SF-36) to assess overall health status, wherein a generic HRQoL questionnaire comprises 36 items that are distributed among eight domains including physical functioning (10 items), physical role (4 items), bodily pain (2 items), general health (5 items), vitality (4 items), social functioning (2 items), emotional role (3 items), health transition (1 item) and mental health (5 items) [15,16]. The adjusted final score ranges from 0 to 100, with 0 representing the worst overall perceived health status and 100 the best overall perceived health status.

2.4. Statistical analysis

All statistical analyses were conducted using the Statistical Package for the Social Sciences version 11.5 (SPSS, Chicago, IL, USA). Statistical significance was set at $p < 0.05$. χ^2 test was used for categorical baseline characteristics. The difference in the SF-36 scores was assessed using a *t*-test. Independent effect of sex was calculated by multivariate logistic regression adjusted for all other variables.

3. Results

3.1. General information

There were 402 patients included in the study, of whom 386 (96%) completed the 180 day follow-up with their baseline characteristics shown in Table 1. Six patients (1.5%) refused or were

unable to participate in this project, six (1.5%) were lost during follow-up, and four (1.0%) were confirmed dead. Of the 386 patients, 57.3% ($n = 221$) were men. Proxy respondents accounted for 23.6% ($n = 91$) of the interviews. There was no statistically significant sex difference in the patients with regard to follow-up status ($\chi^2 = 0.55$, $p = 0.46$). Some sex differences were evident at baseline. Female patients were older than males (66.2 *versus* 62.8 years), more likely to have a history of transient ischemic attack ($\chi^2 = 17.03$, $p < 0.01$), less likely to have a history of heart disease ($\chi^2 = 4.03$, $p < 0.05$), and less likely to smoke ($\chi^2 = 40.83$, $p < 0.01$). There was a trend toward greater prevalence of diabetes in women ($\chi^2 = 2.55$, $p = 0.14$), and a greater prevalence of hypertension in men ($\chi^2 = 2.56$, $p = 0.14$). A difference in stroke subtype was also evident, with a larger proportion of women having intracranial cerebral hemorrhage ($\chi^2 = 4.41$, $p < 0.05$). No statistical difference was noticed for race group differences ($p = 0.34$). Female patients tended to have larger initial stroke and higher NIHSS score than male patients at admission, but this difference was not statistically significant ($\chi^2 = 4.19$, $p = 0.12$). At discharge, female patients were more likely to have worse outcomes, which were reflected by significantly lower mRS scores than male patients ($\chi^2 = 6.51$, $p < 0.05$).

3.2. Sex differences in ADL independence of participants

As shown in Table 2, among the 386 patients 288 had a BI ≥ 95 at 6 months after discharge. In unadjusted data, the odds ratio (OR) for women (0.47) reaching ADL independence was lower than that for men, which decreased to 0.37 after adjustment for age, pre-stroke ambulatory status, follow-up type, mRS score, and NIHSS score. The patients ≥ 80 years old, having questions answered by their proxies, or with relatively high NIHSS scores (≥ 14) had low OR of 0.23, 0.20, and 0.31 respectively, of ADL independence after adjustment.

3.3. Sex differences in SF-36 scores

As shown in Table 3, the largest mean difference among the tested parameters was observed for emotion in patients who completed the interviews by themselves ($t = 12.36$, $p < 0.01$), but this was not seen for those having questions answered by their proxies ($t = 1.356$, $p = 0.08$). Similar magnitudes of mean difference were observed for physical functioning ($p < 0.01$), bodily pain ($p < 0.05$), vitality ($p < 0.05$), social functioning ($p < 0.05$) and mental health ($p < 0.05$), and all showed significant sex differences. There was no significant sex difference in the scores for physical role in SF-36 domains. Logistic regression mode found that age, sex, NIHSS score, stroke subtype, pre-stroke ambulatory status, interview source and medical history were adversely correlated with HRQoL. However, after adjustment for age, race, stroke subtype, medical history, and NIHSS score, sex was found to be the major factor that affected stroke recovery (Beta = 0.13, $p < 0.01$) (Table 4).

4. Discussion

Several studies have shown that stroke patients have worse QoL than the general population in the first year after stroke, particularly in the aspects of physical factors [17,18]. Cross-sectional data suggest that HRQoL and well-being are significantly impaired in stroke patients. HRQoL has been increasingly used as an important measurement for assessing the impact of stroke on individuals, and it not only focuses on neurological deficits or compromised functioning but also considers QoL as an inherent attribute of self-perception, meaning it can measure various aspects of general health

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